

capable of supporting programs addressed to all of the objectives cited in the Space Act would exist.

The usefulness of space

The fundamental ways by which operations in space differ from those conducted on or near the ground are the guideposts to the manner in which space-based operations can be utilized for scientific and technological programs aimed at harnessing space for human welfare. Four highly useful and exploitable features of extended operations in space are these:

(1) *Comprehensive overview*.—Areas of the earth which are countrywide, continent-wide, or hemispheric in scope can be viewed for purposes of observation or communication. (Earth Resources, Meteorology)

(2) *Absence of atmosphere*.—Absence of atmosphere permits astronomical and astrophysical observations with a clarity and breadth not possible from earth. (Astronomy)

(3) *Weightlessness*.—The weightlessness in space permits new insights into matter, energy, and life processes through experiments and measurements not possible in earth's gravity field. It allows erection and assemblage of large structures without constraint of deflections due to weight. (Biology, Orbital Operations and Logistics, R and D in Advanced Technology, Long-Term Flight, Meteorology)

TABLE I.—*Space act objectives*

Space Act of 1958 objectives, sec. 102(c)	Field of interest	Activity or discipline	Activity for man in space
1. Extension of human knowledge.	Science.....	Physics, chemistry, biology, astronomy, medicine, planetary exploration.	Biology, astronomy, long-term flight, aerospace medicine.
2. Increased efficiency of spacecraft.	Technology.....	Launch vehicles, ground support, orbital operations, long-term flight systems.	Orbital operations, R. and D. in advance technology.
3. Development of capabilities of spacecraft.			
4. Utilization of space.....	Applications.....	Communications, meteorology, cartography, resources, Earth sciences.	Meteorology, Earth resources.
6. Information exchange.....	International relations.....	Pioneering programs, international programs.	All.
5. U.S. leadership.....			
7. International cooperation.	Economics.....	Department of Defense, Department of Commerce, Department of the Interior, Department of Agriculture, etc.	Do.
8. Cooperation with Government agencies.			

(4) *Long flight duration*.—Flight lifetime limited principally by ingenuity in providing reliable operation equipment. (Long-Term Flight)

These features of the space environment exploited, singly or in combination, using the unique capabilities of man as an onboard investigator in a spacecraft of adequate payload capacity, offer such potential benefit in so many fields of interest as to compel an examination of the requirements for a manned space station.

The Role of a Manned Space Station

The most important advantage of man in space is found in his capability to observe and act upon unforeseen phenomena and events. Research is inherently oriented to the discovery of the unknown and unanticipated and requires the active participation of a staff possessing the necessary judgment, experience, and skills. Thus, man's role in an orbiting space station is similar to his role in a research laboratory on earth.

The active participation of a laboratory staff permits experiments and tasks to be undertaken that would otherwise be impossible or are so complex that the probability of successful completion with an automatic system is low. For example, man's potential ability to erect and assemble large equipment in orbit and maintain it for long periods of time affords a flexibility and reliability that